

# Today's Missouri River

## A North Dakota Perspective

The Missouri River has been an important resource for people living along or near it for thousands of years. As time went on and the corridor of the Missouri River was developed and populations increased, efforts have been made to control flows, create storage, and prevent flooding. As a result, six mainstem dams have been in place for over 50 years with the goal of bringing substantial economic, environmental, and social benefits to the people of North Dakota and nine other states.

Since the building of the mainstem dams, it has been realized that for all of the benefits that were provided, the dams have also brought controversy. They have created competition between water users, loss of riparian habitat, impacts to endangered species, stream bank erosion, and delta formation - which are only a few of the complex issues related to today's Missouri River management.

This educational booklet will outline the many benefits that the Missouri River provides, and also summarize some of the biggest issues that are facing river managers and residents within the basin today. Topics discussed throughout this publication include: the development of the reservoir system, water use, federal policies and regulations, sovereign lands, threatened and endangered species, the 2011 flood, riparian development, water supply challenges, recreation, water quality, sediment deposition, and delta formation.



### TOPICS

- The River System
- Sovereign Land Management
- Threatened & Endangered Species
- Riparian Development
- Water Supply
- Recreation
- Water Quality
- Sediment Deposition & Delta Formation
- 2011 Missouri River Flood
- Federal Water Use Challenges
- Additional Information



Developed by the  
North Dakota  
State Water  
Commission

# THE RIVER SYSTEM

The Missouri River was once free flowing with meandering braided channels, sand bars, and expansive tree-covered riparian areas. The river was free to make its own banks, which were ever changing, and seasonal flooding was a common occurrence.

Today, six dams and reservoir projects make up the Missouri River reservoir system. All of these dams were constructed by the federal government and are maintained and operated by the U.S. Army of Engineers (USACE) for the following authorized purposes:

- Flood control
- Water supply
- Recreation
- Irrigation
- Hydropower
- Water quality
- Fish and wildlife
- Navigation

The first dam that was constructed was Fort Peck in Montana. Fort Peck was constructed under Congressional authorization from the Rivers and Harbors Act of 1935. The other five mainstem dams on the Missouri River were later built in cooperation between the USACE and the Bureau of Reclamation under the Pick-Sloan Plan. The Pick-Sloan Plan was part of the Flood Control Act of 1944.

Throughout the next 19 years, the five remaining mainstem dams were built, including; Garrison, Oahe, Big Bend, Fort Randall, and Gavins Point. Garrison Dam is located in North Dakota, while Oahe, Big Bend and Fort Randall Dams are all located in South Dakota. Gavins Point Dam is located on the South Dakota/Nebraska border. Along with each of the dams on the Missouri River, reservoirs were also created. These Reservoirs are Fort Peck Lake, Lake Sakakawea, Lake Oahe, Lake Sharpe, Lake Francis Case, and Lewis and Clark Lake. Lake Sakakawea is the largest reservoir on the Missouri River, with a storage capacity of nearly 24-million acre-feet.

## MISSOURI RIVER MAINSTEM DAMS



The USACE operates the Missouri River Dams under the guidance of the Master River Water Control Manual (Master Manual). The manual was originally developed in 1960, however it has been modified as needed with the latest revision in 2004. The Master Manual incorporates management strategies for the multitude of purposes that the USACE is charged with.



# SOVEREIGN LAND MANAGEMENT

North Dakota's sovereign lands are those areas lying within the ordinary high water mark of navigable lakes and streams, including beds and islands. More specifically, sovereign lands are those areas located below what is known as the ordinary high water mark – which is basically the line created by a river or lake when it is at an ordinarily high level. With the exception of oil, gas, and related hydrocarbons, which are the responsibility of the Department of Trust Lands, the State Engineer is responsible for administering all the state's interests on North Dakota's sovereign lands.

In North Dakota, the Missouri River is considered to be navigable and therefore, management of its associated sovereign lands falls on the State Engineer for the best interest of present and future generations of North Dakotans.

The Missouri River's abundant and expansive sandbars and islands, clear water, and beauty have contributed to a tremendous amount of interest from recreationists, landowners, and developers. This is especially true in the Bismarck-Mandan area. Numerous new housing developments have been built along the river and private landowners enjoy the benefits of living in close proximity to the river.

The recreational use of the Missouri River has also become increasingly popular. Boating, fishing, picnicking, and other general water-based recreation activities take place, especially in the summer.

At times the popularity of the river and its heavy use can cause conflicts between users, particularly between private landowners along the river and the recreating public. In addition, staff of the State Engineer continually survey sovereign lands for encroachments such as unauthorized structures, yards, and other non-compliant uses.

Another issue with the high and ever-increasing recreational uses of sovereign lands along the

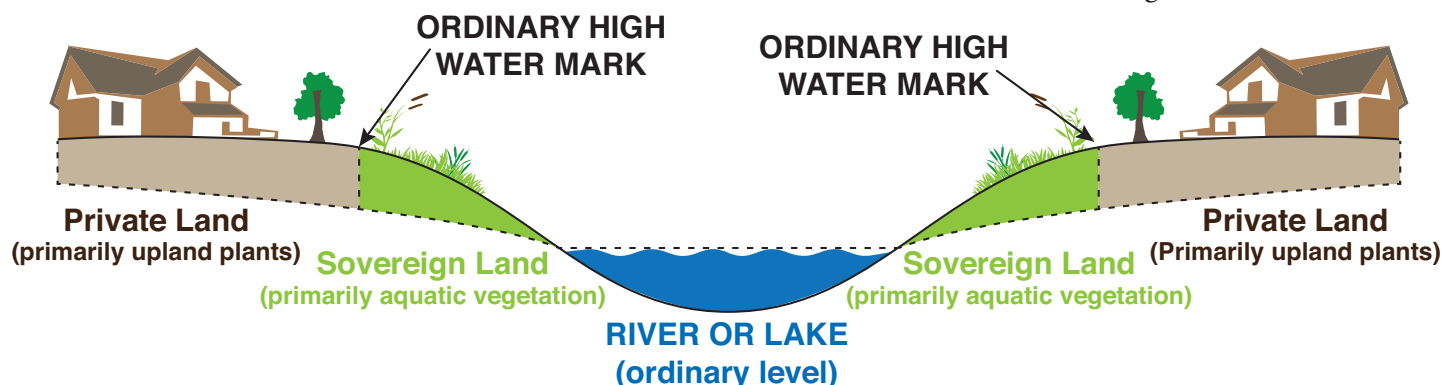
Missouri River is trash and litter. In the spring of 2014, the Office of the State Engineer increased efforts to reduce littering and glass containers on sovereign lands. Signs were installed at access points to make the public aware that it is illegal to litter or possess glass containers on sovereign lands. The fines are \$250 for littering and \$100 for the possession of glass containers. The intention of this enforcement is not to issue a lot of citations, but to protect our waters and beaches by keeping them an attractive and safe place to recreate.

Also, in 2014, administrative rules were modified to clarify that operation of motorized vehicles is not legal on sovereign land. The use of motorized vehicles on sovereign lands is allowed when it is a necessary part of an authorized project; when launching or loading a watercraft; when



With increased recreational use of sovereign lands along the Missouri River, littering has become a major issue.

the operator or rider is physically impaired and their vehicle displays the handicap sticker or tag; when accessing for ice fishing on trails or roads authorized by the State Engineer; and by agricultural producers when herding livestock, maintaining a livestock fence, installing or maintaining an agricultural irrigation water intake, or for other ordinary agricultural practices. The fine for illegal motorized vehicle use on sovereign lands is \$100.



The above diagram demonstrates where sovereign lands are located along navigable streams and lakes.

# THREATENED & ENDANGERED SPECIES



Piping Plover



Least Tern



Pallid Sturgeon

There are many wildlife, plant, and insect species that are listed as threatened or endangered throughout North Dakota. However, there are two bird species and one fish species on the Threatened and Endangered Species list specific to the Missouri River. These are the piping plover, least tern, and the pallid sturgeon. Each of these three species have been negatively impacted by the construction of the mainstem dams, and river channelization.

The threatened piping plover and the endangered least tern are shore birds that traditionally relied on the natural flows of the Missouri River to provide their preferred habitat along the shorelines and on sandbars. These birds prefer a specific aggregate type where they build their nests. Prior to the building of the mainstem dams, the Missouri River would flood in the spring and early summer coinciding with the prairie snowmelt and mountain snowmelt, respectively. These floods would move sediment and build sandbars creating the species' preferred habitat. After the building of the dams, these natural processes were greatly altered along the open sections of river. This is compounded by continually fluctuating reservoir levels behind the dam, which often flood active nesting locations.

The US Fish and Wildlife Service, with assistance from many other

federal and state agencies, participate in recovery efforts for these bird species by documenting nesting birds, monitoring them, assisting with moving nests if necessary, and regulating public access in areas of active nests. Sometimes these access restrictions are located in areas of high public use, creating conflicts with recreational uses. To mitigate additional impacts to terns and plovers, the USACE periodically manipulates river flows to ensure that birds are nesting in safer locations.

Another species that has been negatively affected by the building of the mainstem dams on the Missouri River is the pallid sturgeon. The pallid sturgeon is a prehistoric fish species that literally was around when dinosaurs walked the earth. The species survived the landscape and climate changes that were associated with the extinction of the dinosaurs and other prehistoric species. However, dam construction has been devastating for the pallid sturgeon. Dams substantially changed their preferred habitat by reducing the natural river courses to short sections, and taking flowing sediments out of the water. Today, it is estimated that there are only 120-150 wild adult sturgeon in the upper Missouri River Basin.

The pallid sturgeon recovery program has incorporated reintroduction through stocking, modifying river

flows and constructing habitat to improve spawning. However, it seems that one of the biggest issues is the lack of continuous river sections that the pallid sturgeon once relied on in their migration for spawning. Because of this, agencies are working on a fish passage at a low head dam near Glendive, MT on the Yellowstone River. The intention of this is to create a longer river corridor that the fish can use to spawn.

In June 2014, the US Fish and Wildlife Service for the first time, found evidence that natural spawning had occurred in the Powder River, a tributary of the Yellowstone river near Glendive, Montana. This is a significant development because it takes 15 years for a pallid sturgeon to reach sexual maturity, meaning that fish from the stocking program are finally of age where they can attempt to reproduce in the wild.

To help with the recovery of threatened and endangered species, the Missouri River Recovery Implementation Committee (MRRIC) was formed in 2008 to serve as a basin-wide forum to develop a shared vision and comprehensive plan for Missouri River recovery. Many of the issues that the MRRIC works on deal with proposed modifications to the river or management strategies aimed at aiding in species recovery.



# RIPARIAN DEVELOPMENT



Residential developments like Misty Water's north of Bismarck have become increasingly popular.

The Missouri River bottoms provide excellent recreational opportunities. Additionally, residents in towns along the Missouri River have found how enjoyable living along the river can be. This is especially true in the Bismarck-Mandan area.

Prior to the construction of the Garrison Dam, there was little commercial or residential development south of Main Street in Bismarck due to seasonal flooding of the Missouri River. With the completion of the dam came a significant reduction in the threat of flooding. It was at this time that real estate developers took advantage of the opportunity to start parceling out property and building in the Missouri River floodplain.

Beginning in the 1970s, the development of riverfront property in Bismarck-Mandan really started to take off. Fox Island in south Bismarck was one of the first residential developments along the river. Today, there are many other areas that have been developed, including Southport, Misty Waters, and Hogue Island in Burleigh County. In Mandan, areas known as Marina Bay, Borden Harbor, and

Lakewood continue to be developed. Many of these areas have private marinas for easy access to the river.

In areas where there is development along the river, one will notice modifications to the riverbank to reduce the amount of erosion. Most often this is done by placing large rocks and boulders, also known as rip-rap, along the banks so they are not damaged or washed away during high flows of the river.

Residential riparian development is very attractive to some people. However, it does not come without cost to the private property owner. There are many permitting requirements and building specifications for construction in a flood prone area. In addition, if you carry a federally backed loan or mortgage for a home in a flood prone area, you must have flood insurance, and flood insurance can be very costly.

But, even with the known risks of flooding, it is unlikely that development will stop in these high-risk areas. The attractiveness of living along the river simply outweighs the risks of future floods to many homeowners.



Rip-rap helps keep the river bank from being damaged during high flows of the river.



# WATER SUPPLY



Rural water pipeline installation as part of the Southwest Pipeline Project.

The Missouri River is a tremendous resource for many of North Dakota's municipal, rural, industrial, and agricultural water users. There are currently several water supply intakes along the Missouri River for various purposes in North Dakota, and two of those are large regional water supply systems – the Southwest Pipeline Project and the Western Area Water Supply.

The Southwest Pipeline Project (SWPP) was established in 1986 to provide a reliable and high quality water supply from the Missouri River to a portion of North Dakota south and west of the Missouri River. The SWPP currently serves 58,000 residents, including 5,350 rural service locations, 31 communities, and 23 raw water customers. With the population continuing to grow in this region of the state, it is expected that the SWPP will continue to grow.

Established in 2011, the Western Area Water Supply (WAWS) is a domestic water project that uses Missouri River water that is treated in Williston, North Dakota to support the municipal, rural, and industrial needs throughout five counties in northwest North Dakota. In 2014, WAWS was already serving

3,300 rural locations and numerous communities in the region. The supply system also operates eight water depots that provide industrial water to the oilfield. It is expected that WAWS will continue to grow into the future to supply high quality water to those in need. It is estimated that WAWS will have the ability to serve 17,000 rural and 143,000 municipal residents in the future.

Currently, the Missouri River is also being looked at to provide water to the Red River Valley. Over the years, various projects have been proposed

to supply Missouri River water to eastern North Dakota. Between 2000-2007, the U.S. Bureau of Reclamation and Garrison Diversion Conservancy District developed plans for a Red River Valley Water Supply Project. An EIS was completed, however, authorities at the federal level never issued a record of decision to allow the project to move forward.

More recently, in 2014, the state of North Dakota and Garrison Diversion Conservancy District started working on studies to evaluate potential intake sites and alignment routes to bring Missouri River water to areas in central and eastern North Dakota.

In addition, a project known as the Northwest Area Water Supply had a NEPA process completed, with a Record of Decision signed by the Bureau of Reclamation in 2015. The preferred alternative is to pipe treated Missouri River water to the northwest portion of the state – providing a safer and more reliable water supply to that region. The future of the NAWS project is dependent upon the outcome of ongoing litigation.



In recent years, there has been increased water demands in western North Dakota, due to tremendous growth.



# RECREATION



Credit: ND Tourism

The construction of Garrison Dam in North Dakota and Oahe Dam in South Dakota resulted in a tremendous loss of river bottom land. Combined, the creation of Lake Sakakawea and Lake Oahe flooded 550,000 acres of prime riparian farmland in North

and Lake Oahe. The agency has established many recreational facilities through partnerships with tribal governments, state agencies, county park boards, water resource districts, and local service groups. In total, Lake Sakakawea has 37 recreation areas within USACE boundaries. Lake Oahe has 14 recreation areas within North Dakota. Services that are offered at these recreation facilities range from boating, camping, and picnicking, to swimming and nature trails.



Credit: Bismarck Tribune

Dakota. To compensate North Dakota for lost land and income from a project that was designed to benefit downstream states, the federal government originally promised over 1.2 million acres of irrigation. However, those large irrigation projects never came to fruition.

Since then, North Dakota has adapted to the post-dam landscape along the Missouri River, Lake Sakakawea, and Lake Oahe. The USACE manages federal lands around the entirety of Lake Sakakawea



Credit: ND Tourism

USACE owned public lands along the Missouri River in North Dakota also provide numerous hunting opportunities. Hunting is allowed on all USACE property as well as on sovereign lands, unless posted otherwise. There are many Wildlife Management Areas that are leased and managed by the North Dakota Game and Fish Department throughout the river system as well.

One of the most popular water-based recreation activities in and along the Missouri River system is fishing. The Missouri River in North Dakota supports an outstanding sport fishery that is extremely important to the local and regional economy. In 2009, anglers harvested over 110,000 walleye, 19,000 sauger, and 1,200 Chinook salmon from Lake Sakakawea and 397,000 walleye and 7,000 sauger from the Garrison Dam to Lake Oahe.





# WATER QUALITY

Prior to the dams being built on the Missouri River it was one of the greatest silt carrying rivers in the world. So much so that it was also known as the Big Muddy. When pioneers were settling along the Missouri River, it was often described as “too thick to drink, but too thin to plow.” Silts and sediments

were carried from sloughing banks during high flows on the river, as well as from its tributaries.

Starting in 1937, when Fort Peck Dam was closed in Montana and again in 1953, when Garrison Dam was closed, water quality was drastically improved. Eventually, with the completion of the remaining

dams, water quality was improved along the entire Missouri River system. The dams and their associated reservoirs allow sediment loads to settle out and decrease turbidity in river sections. Today, water quality in the Missouri River is among the best in North Dakota for domestic and industrial purposes.

## SEDIMENT DEPOSITION & DELTA FORMATION

The Missouri River dams and their associated reservoirs create areas where water is stored, river current is diminished, and sediment loads have the ability to settle to the river/lake bed. This process provides for better water clarity and overall quality. However, it also creates significant negative impacts, not unexpectedly, sediment deposition and delta formation.

Over the past sixty-two years since Garrison Dam was closed, sedimentation has been occurring at the upper reaches of Lake Sakakawea, specifically around the Williston, ND area where the headwaters of the reservoir are located. The same process happens south of Bismarck at the headwaters of Lake Oahe.

Sedimentation has a negative impact on flood protection structures such as levees. The city of Williston has an extensive levee system in place to protect from floodwaters of the Missouri River and Lake Sakakawea. Due to

the flood of record in 2011 and sedimentation over time the levees need to be heightened.

Accumulated sedimentation at the mouth of the river, or upstream reaches of Lake Sakakawea and Lake Oahe, have caused the formation of deltas at each location. A delta is an area where widespread sediment has deposited, causing the water to no longer flow through a defined channel. Instead, the river forms braided, meandering, shallow areas. The deltas in the Missouri River have lessened the storage capacity of the reservoirs, and can also contribute to river elevation rises. This can also contribute to ice jams and localized flooding because of restricted river flows.

The USACE has recently conducted studies to identify a variety of alternatives to mitigate this process. Increased flows to clear the channel, and dredging and excavating river channels to increase water velocity are two alternatives. However, most mitigation techniques only provide for temporary relief as sediment builds back up over time.



Deposited sediment along the Missouri River provides for excellent recreation areas in the summer, however, they can cause serious issues with ice jams in the winter and spring.



# 2011 MISSOURI RIVER FLOOD

Since the completion of Garrison Dam, the Bismarck-Mandan area experienced very few flood-related impacts. In 1975 and 1997, high spring/summer runoff caused moderate flooding in communities. However, the region had never seen a flood similar to that of the unprecedented flooding in 2011 in the post-dam era.

In 2011, flooding in the Missouri River basin was caused by numerous factors that all happened in sequence. Going into the winter of 2010-2011, much of the upper Missouri River basin had already experienced an unusually high amount of precipitation. This caused soils to be saturated before winter. When the snow did come, it came in record amounts. The northern United States was stuck in a persistent storm track that transported several significant storm events through the region throughout the winter months. For example, locations that average 30 inches of snowfall per year received 108 inches!

With the Missouri River reservoirs drawn down to account for spring runoff as usual, no one anticipated what would happen next. The rain started to fall.

As tremendous rainfall amounts began to accumulate in early summer 2011, the USACE changed their flood projections numerous times and they continually increased releases from Garrison Dam. Burleigh and Morton Counties, the cities of Bismarck and Mandan, and private citizens began constructing temporary levees, plugging marina inlets along the river, and sandbagging private residences. Many people were forced to evacuate their homes because of impending floodwater.

On June 1, 2011, the spillway gates at Garrison Dam were opened for

the first time in history to release floodwater, and one day later the Missouri River went above flood stage in Bismarck-Mandan and remained above flood stage until August 30.



Garrison Dam spillway opened for the first time to release floodwater on June 1, 2011.

In spite of the hard work of all parties in the flood fight, it was not possible to provide flood protection for everyone. Many homes were severely damaged or destroyed in the floodwaters.

During the same time that the Bismarck-Mandan area was fighting the flood, there were many other communities that were affected as well. At Fort Yates, along the south shores of Lake Oahe, the USACE worked on a project to strengthen the shoreline so that floodwater would not damage the levees that had been

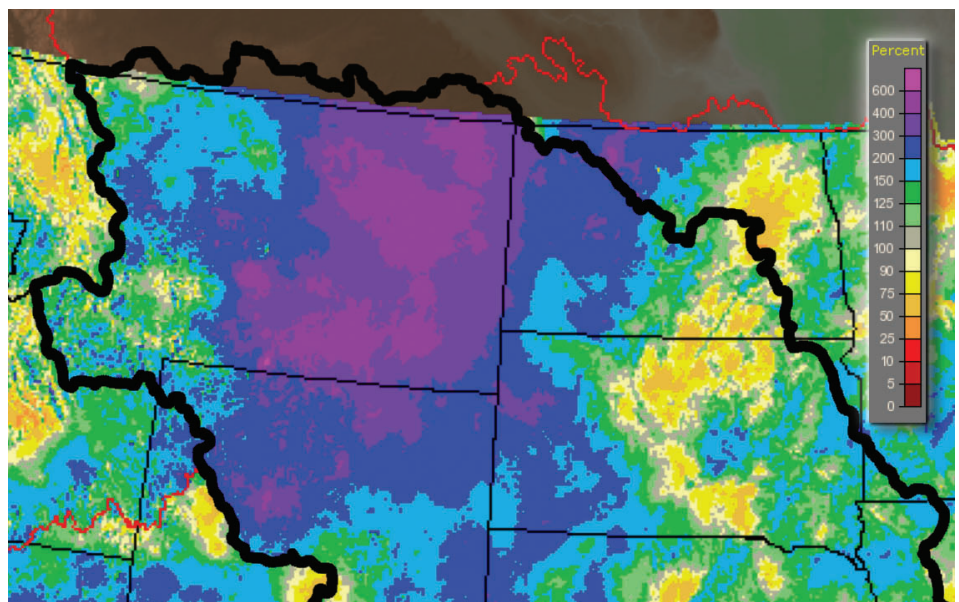
in place for decades. In Williston, boils or leaks formed in the city's permanent levees that had been in place for decades. There was concern that the boils could ultimately cause the levees to fail, which would have jeopardized the city's water supply and sewage treatment facility.

Since the flood of 2011, the Williston levee has been rebuilt and all new monitoring instrumentation has been installed. In all, \$20 million was spent over three years to rebuild the system.

In the Bismarck-Mandan area, there was a lot of clean-up and rebuilding that took place after the flood. In some flooded locations, the county bought out homes. Also, plans are in the works for permanent flood control projects in several areas in the Bismarck-Mandan area to protect against possible future flooding.

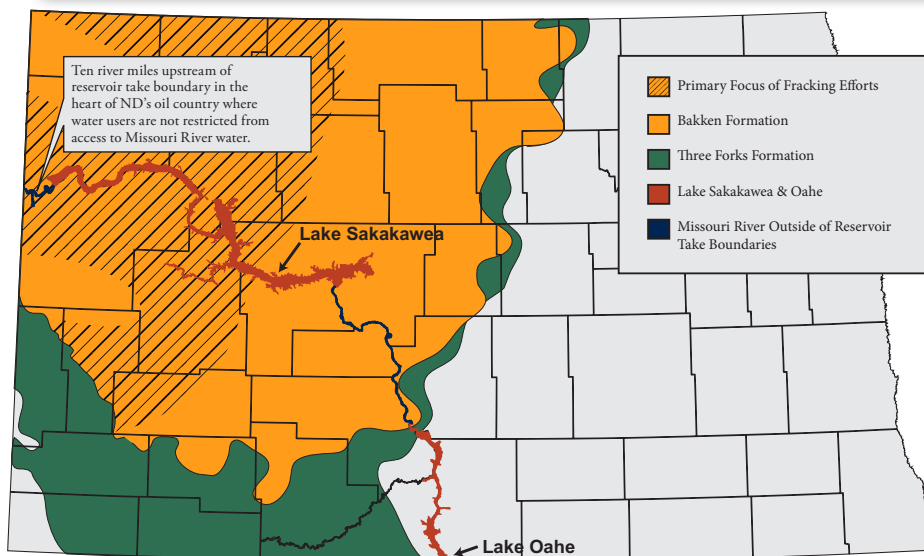


June 2011 flood, Mandan, North Dakota.



For the month of May 2011, precipitation values averaged 300-400 percent of normal over the eastern third of Montana, while western North Dakota received between 150-300 percent of average precipitation.

# FEDERAL WATER USE CHALLENGES



The State of North Dakota is currently in conflict with the USACE over their Surplus Water Policy. The Missouri River system is located in the heart of North Dakota's oil production efforts, which relies heavily on available water supplies to support not only fracking efforts, but growing domestic demands as well. However, though the Missouri River contains massive amounts of water that is readily available, water users in North Dakota have been denied access within reservoir boundaries by the USACE in recent years – pushing fracking operations toward alternative sources of water.

The USACE has been restricting access to Missouri River flows under their Surplus Water Policy. This proposed policy is very complex, but in general, the USACE contends they have authority through the Flood Control Act of 1944 to charge fees for

the use of “surplus” stored water in the mainstem reservoirs. The USACE defines surplus water as water that is available because of authorized project uses that were never fully developed.

The State of North Dakota has adamantly opposed this new USACE policy, maintaining that the natural flow of the Missouri River through the reservoirs is more than adequate to serve North Dakota's water users without storage. The Missouri River continues to flow through Lake Sakakawea and Oahe, and those flows are not stored. Therefore, those flows belong to the people of North Dakota to be put to beneficial use as Article XI, Section 3 of North Dakota's Constitution provides that “All flowing streams and natural watercourses shall forever remain the property of the state for mining, irrigating and manufacturing purposes.”

The USACE has restricted access to Missouri River flows within the boundaries of Lake Sakakawea and Oahe. That leaves very few Missouri River miles accessible to industrial water users within the heart of North Dakota's oil country. Furthermore, the over-reach of this policy could have negative implications for existing municipal and industrial water intakes in the future.

In 2014, Congress passed the Water Resources Reform and Development Act, which included language that prohibits the USACE from charging fees for water withdrawn from Missouri River reservoirs for ten years. However, the legislation did not address the issue that it is the right of basin states to control the use of that water.



Credit: ND Tourism

## ADDITIONAL INFORMATION



ND STATE WATER COMMISSION  
900 E. BOULEVARD AVE., DEPT 770  
BISMARCK, ND 58505

(701) 328-4989  
[www.swc.nd.gov](http://www.swc.nd.gov)  
Email [swc@nd.gov](mailto:swc@nd.gov)



/NDStateWater